KALMIOPSIS

Journal of the Native Plant Society of Oregon

ISSN 1055-419X V6 1996

KALMIOPSIS

Journal of the Native Plant Society of Oregon ©1996

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Editorial

This issue of *Kalmiopsis* is a bit thin. We could have used another feature but this year it has been particularly difficult prying articles out of folks. I guess everyone has been busy. I do like what we have, though. Working on Bruce's article made me want to revisit probably the least known section of our coast. I continue my inclusion of history in *Kalmiopsis* with Rhoda's short but sweet (I had to say it) piece on the founder of the UO Herbarium. And in Howie's examination of *Artemisia ludoviciana* ssp. *estesii* he writes evocatively about the Deschutes region. The plant of the year is so spectacular I had to put it on the cover.

This is my final issue as editor. I have enjoyed doing it but I have too many demands on my time these days. I would like to encourage anyone literarily inclined to seriously consider taking up the red pencil and becoming editor of *Kalmiopsis*. You will be glad you did.

MEMBERSHIP

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COVER PHOTO

Western Lily *(Lilium occidentale)* — Photograph by Dave Imper.

KALMIOPSIS: ISSN 1055-419X. V6 1996. Published yearly. Subscription $12 per year. Native Plant Society of Oregon
General business address: P.O. Box 902, Eugene, OR 97440

OREGON PLANTS, OREGON PLACES

Botanizing The Southern Oregon Coast (Coos Bay To Port Orford)

By BRUCE RITTENHOUSE

The scenery along Highway 101 between Coos Bay and Port Orford, Oregon does not reflect an area that has a high diversity of plant species. When one gets off the main routes, however, and explores the vegetation, many plant communities can be found, ranging from coastal beaches and sand dunes (coastal strand), prairies, fresh- and salt-water wetlands, and mixed coniferous forests, resulting in a high diversity of plant species. The south coast is at the confluence of two floristic zones, the Pacific Northwest Floristic Province to the north and the California Floristic Province to the south. Along the coast these two floristic zones meet at Coos Bay (Howell 1957, Barbour and Major 1988). Coos Bay is also the boundary between the subarctic and Mediterranean beach floras (Wiedemann 1984). As a result many coastal species reach their southern or northern limits. For example, southern species reaching their northern limits include dwarf brodiaea *(Brodiaea terrestris* ssp. *terrestris)*, beach sagewort *(Artemisia pycnocephala)*, and California beach-aster *Lessingia filaginifolia* var. *californica)*; while northern species such as sea purslane *(Honkenya peploides)*, large-headed sedge *(Carex macrocephala)*, sweet gale *(Myrica gale)* and many others reach their southern limits here.

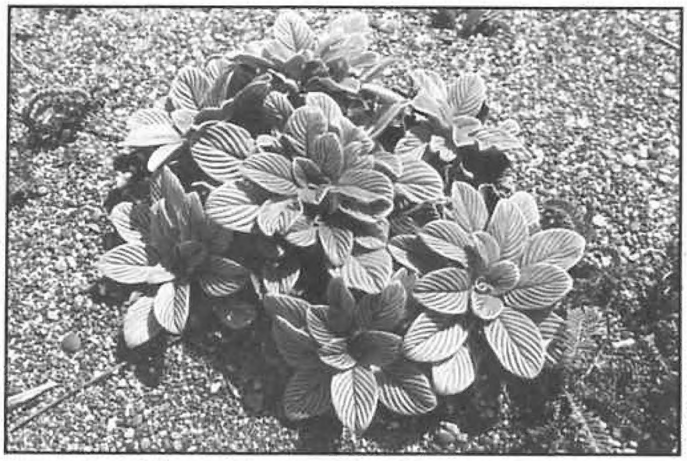
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Figure 1 — Silvery phacelia *(Phacelia argentea)*

Species endemism (taxa restricted to a specific area), although not high, is also evident along the southern Oregon and northern California coast between Capa Arago and Cape Falcon (at Crescent City). Species such as wolf's evening-primrose *(Oenothera wolfii)*, silvery phacelia *(Phacelia argentea)* (Figure 1), large flowered goldfields *(Lasthenia macrantha* ssp. *prisca)* occur only within this stretch of coastline (approximately 150 miles). Many of these species are restricted to specific habitats, such as sand dunes and exposed coastal headlands. A few other common species are also considered maritime beach endemics which occur only along the beaches and dunes of the Pacific Coast of North America (Wiedemann 1984). These include: yellow sand verbena *(Abronia latifolia)*, beach bursage *(Franseria chamissonis)*, glehnia *(Glehnia littoralis* ssp. *leiocarpa)*, beach evening-primrose *(Camissonia cheiranthifolia)*, seashore bluegrass *(Poa macrantha)*, beach knotweed *(Polygonum paronychia)*, and dune tansy *(Tanacetum camphoratum)*.

Unlike other parts of Oregon which are better known wildflower areas, such as Steens Mountain, the Wallowa Mountains, and the nearby Siskiyous, the southern Oregon coast's botanical treasures remain largely hidden. This article is intended to provide the reader with an introduction to the unique plant communities and plant species which occur along this stretch of coast and to point out sites where one can enjoy the area's botanical resources.

Climate

The climate of the area is greatly influenced by the Pacific Ocean. Summers are mild (average daily temperature is 59°F), but hot days are rare. Rainfall is extremely light during the summer and in most years several weeks may pass between rainfall events. Fog is common during the summer months along the immediate coast and major river drainages. Fog typically will move inland about mid-afternoon and persist until the next morning. Strong northwest winds are also common in summer.

Winters are cool (average temperature is 40°F), but relatively mild. Approximately 80% of the yearly precipitation (between 55 and 75 inches), in the form of rain (rarely snow), occurs during the months of November to April. Winter rainfall may be steady over a period of several days, and occasionally rainfall intensities may exceed 4 inches over a 24 hour period. Fog is less common in the winter. Winds are typicaly out of the southwest, with intense winter storms where winds may exceed 80 miles per hour.

Geologic History and Soils

Much of the area is underlined by old marine terraces, with the most recent being the Whiskey Run Terrace (Baldwin 1964). These terraces range from nearly level to gently sloping areas composed of sandy sediments deposited during the early Pleistocene (less than one million years). They were formed as a result of leveling by wave erosion and long-term regional uplift (Baldwin 1964). The Whiskey Run terrace (Figure 2) is particularly well exposed between Bandon and Cape Blanco where in places it is 4-6 miles wide.

Soils between Bandon and Cape Blanco include unconsolidated sands, Heceta-Waldport sands, and the Bullards-Bandon-

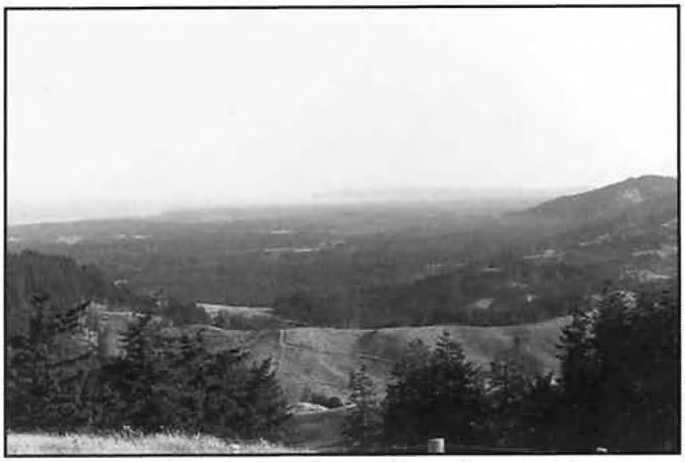
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Figure 2 — *Whiskey Run Terrace, Cape Arago in distance*

Blacklock soil complex (USDA 1989). Unconsolidated dune sands typically occur on the ocean beaches. These consist of loose sand and shell fragments that have been influenced by wave action, tides, and wind. In a few areas, such as Floras Lake, the substrate consists of small pebbles. These areas all have very little organic matter, except where they have been stabilized with European beachgrass *(Ammophila arenaria)*, and tend to be very permeable.

Soils on the old marine terraces behind the sand dunes are composed of a complex of soils called Bullards-Bandon-Blacklock soils. Bullards soils are well drained and occur in areas dissected by streams. Bandon soils are also well drained and occur in broad, gently to moderately sloping areas. The soil of interest is the Blacklock soils. Many of the unusual and rare species, including western lily *(Lilium occidentale)* (Figure 3), occur here. These deep, poorly drained soils occur in depressional areas of marine terraces. They have a highly organic topsoil with a cemented hardpan approximately 18 inches below the surface. Permeability of water through this cement-like soil is very slow. This hardpan perches water and creates many of the wetlands in the area. It is on these soils where cranberry production is the greatest.

Plant Communities

The following is a brief description of the ecology and common plant species of the plant communities which occur in this region.

Salt Marshes — These plant communities are restricted to the upper intertidal zones of coastal bays and estuaries. Locally they can be found in Coos Bay and Bandon estuaries. These plant communities are dominated by halophytes (salt loving species). The dominant conditions are the changing tides which inundate portions (or all) of these plant communities twice during a 24 hour period. Environmental gradients are established in response to slight elevational change which are caused by different frequencies and duration of tidal flooding. The result is a vertical zonation of different species across the salt marsh based on different salinity tolerances (MacDonald 1988).

A few of these species, pickleweed *(Salicornia virginica)* and saltgrass *(Distichlis spicata)* occur across the entire salt marsh while other species such as bird's-beak *(Cordylanthus maritimus* ssp. *palustris)*, sea-lavender *(Limonium californicum)* and tufted hairgrass *(Deschampsia caespitosa)* occur only within narrow elevational bands within the salt marsh.

Salt marsh floras are relatively well known and when compared with other habitats are generally depauperate. Besides the above mentioned species, other common plants in coastal salt marshes are fleshy jaumea *(Jaumea carnosa)*, salt marsh dodder *(Cuscuta salina* var. *major)*, arrow-grass *(Triglochin maritimum)*, sand spurrey *(Spergularia* ssp.*)* and seaside plantain *(Plantago maritima)*.

Coastal salt marshes have been heavily impacted by humans filling in wetlands for urbanization and diking them for agricultural purposes (grazing livestock). While no figures are available for the proportion of salt marshes that have been "reclaimed" in Oregon, only 9% of the salt marshes in Humboldt Bay remain (as of 1973) from historic conditons (MacDonald 1988). It can be assumed that well over 50% of the salt marshes in Oregon have been lost. This, along with the narrow ecological requirements of some species, results in a habitat that has many threatened species.

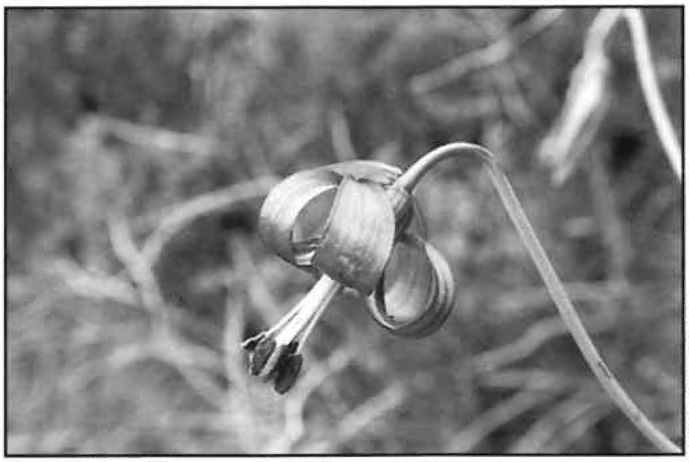
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Figure 3 — Western lily *(Lilium occidentale)*

Coastal Strand — These are plant communities ocurring both on beaches above high tide and on sand dunes behind the foredune. Sand dunes within this section of the oregon Coast are not as extensive as they are north of Coos Bay in the Oregon Dunes National Recreational Area. Most of the sand dunes in this area occur north and south of Bandon.

Since the establishment and subsequent naturalization of European beachgrass this habitat has decreased as the width and height of the foredune has increased. The physical conditions of these habitats are adverse and have high substrate instability, nutrient-poor soils, a high exposure to salt spray and "sandblasting" (caused by daily northwesterly winds) which leads to a shifting, sandy substrate.

Vegetation on beaches is generally low in species richness and plant cover. On most beaches typically only 2-3 species (such as *Cakile* ssp., beach bursage, and yellow sand verbena) are present on the ocean side of the foredune. These species are typically herbaceous perennials (the exception is *Cakile*) which are evergreen, succulent, and prostrate. Many of these species are early colonizers which begin sand stabilization. Seed production is typically low as the majority of these species disperse by rhizomes or stolons. Seed dispersal is primarily by wind and possibly by tides. Yellow sand-verbena fruits have small wings which aid in dispersal along the beach. In some cases (although undocumented) long term dispersal may be caused by seeds being swept into the tide and being deposited on another beach.

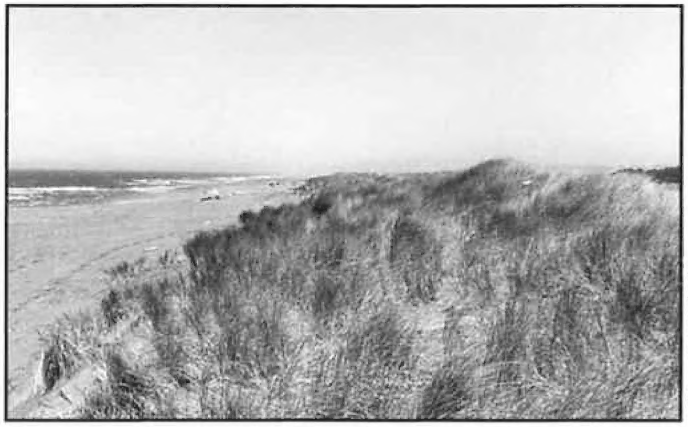
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Figure 4 — *Coastal beach and foredune with European bunchgrass*

Historically, (pre-European beachgrass) beaches in this area (and along the entire Pacific Coast) had a low foredune, which rose gradually from the beach. The foredune consisted of rounded mounds caused by the native sand stabilizing plant species. The dominant species included American dune grass *(Leymus mollis* ssp. *mollis)*, yellow sand verbena and beach bursage. This resulted in a series of dunes alternating with swales which were oriented perpendicular to the coast (that is, aligned with the prevailing onshore winds). Very few of these low, mounded foredunes remain along this section of coast, with the exception at river mouths, such as New River. With the establishment of European beachgrass these rounded dunes have been replaced by a steep foredune (figure 4) and inland dunes oriented parallel to the coast (Barbour and Johnson 1988). European beachgrass may reduce native species richness by up to one half (Barbour et al. 1976). This has resulted in many of these plant communities being threatened (although most of the plant species are relatively common).

European beachgrass deserves special attention due to its impact on vegetation along the Pacific Coast. It was first introduced to North America in 1869 at San Francisco (Wiedemann 1987). Extensive plantings occurred on the Oregon coast from the 1930s to 1950s. It now occurs from the Queen Charlotte Islands south to southern California. European beachgrass grows best in areas where sand accretion is greatest (windward side of dunes). When established, the plants develop a vigorous rhizome system, both horizontal and vertical (Wiedemann 1987). Under conditions of heavy sand accretion many new shoots arise from the nodes of the vertical rhizomes, thus creating hummocks. Although the plants produce numerous seeds, very few of these survive. It appears that conditions along the Oregon coast, such as strong onshore winds, moderate year round temperatures, ample rainfall and an abundant sand supply favor the growth of European beachgrass. Many efforts have been made in recent years to control European beachgrass in certain areas, all with little success. Methods have included herbicides, burning, tilling, salt-water irrigation, and manual removal. It appears the best method may be a combination of two or more of these methods over a long period of time.

As a result of dune stabilization, many of the plant species occurring on the dunes are introduced species. These include; sweet vernalgrass *(Anthoxanthum odoratum)*, ripgut brome *(Bromus diandrus)*, hairy cat's-ear *(Hypochaeris radicata)*, and in this area, gorse *(Ulex europaea)*. These, and other exotic species make up a large proportion of the vegetation on most of the sand dunes in the area.

Behind the foredune is the deflation plain, which is formed when sand is eroded away to the water table (Wiedemann 1984). Since the establishment of European beachgrass the deflation plain has steadily increased in width. Species present in these communities include many species of sedges *(Carex* ssp.*)*, rushes *(Juncus* ssp.*)* and spike rushes *(Eleochaeris* ssp.*)*.

North and south of the Coquille River, sand dunes occur in land behind the deflation plain. The conditions in these habitats are more favorable (higher subsrate stability, less exposure to salt spray) than on the ocean beaches. In fact many of these inland dunes are stabilized to the extent that the dominant vegetation species is shore pine *(Pinus contorta* ssp. *contorta)*. In areas where remnant dunes remain, the native vegetation consists of seashore bluegrass, seaside fescue *(Festuca rubra* ssp. *littoralis)*, seaside lupine *(Lupinus littoralis)*, beach evening-primrose, and beach morning-glory *(Calystegia soldanella)*.

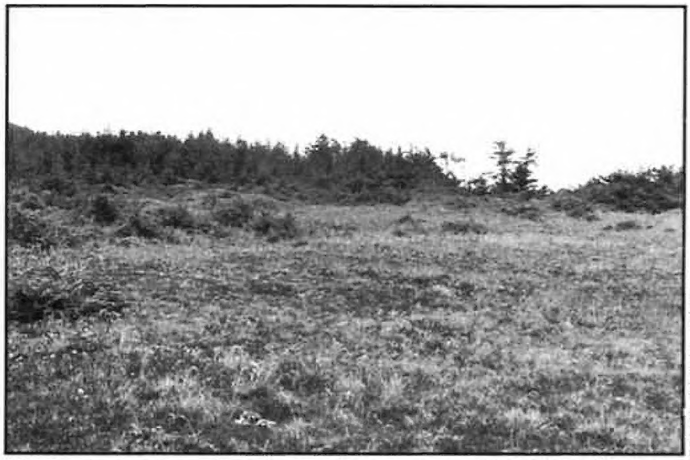
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Figure 5 — *Coastal prairie at Shore Acres State Park*

Coastal Headlands — Coastal headlands (figure 5) are dominated by evergreen shrubs, usually less than 2 meters tall, and wind pruned tress. Species include coyote brush *(Baccharis pilularis)*, salal, black crowberry *(Empetrum nigrum)*, common juniper *(Juniperus communis)*, hazel nut *(Corylus cornuta)*, black twinberry *(Lonicera involucrata)*, and wax myrtle *(Myrica californica)*. Herbaceous species include reed grass *(Calamagrostis nutkaensis)*, frosted paintbrush *(Castilleja affinis* var. *littoralis)*, and Bolander's sneezeweed *(Helenium bolanderi)*. These plant communities endure very harsh environmental conditions including, strong winds, year round salt spray, and fog. Examples of these coastal headland communities can be seen at Shore Acres State Park, Capa Arago, Cape Blanco and Blacklock Point.

Coniferous Forests — Coniferous forests in this region occur on soils ranging from stabilized sand to soils on old marine terraces. These forests are primarily composed of shore pine, Sitka spruce *(Picea sitchensis)* and Port Orford cedar *(Chamaecyparius lawsoniana)* and more protected areas Douglas-fir *(Pseudotsuga menziesii* var. *menziesii)* and western hemlock *(Tsuga heterophylla)*. These coastal forests have a dense understory composed of many ericaceous shrubs such as rhododendron *(Rhododendron macrophyllum)*, salmonberry *(Rubus spectabilis)*, black twinberry, and wax-myrtle. Aerial photographs from the 1940s and 1990s show that these forests have become more abundant on sand dunes. This is probably a result of the establishment of European beachgrass which has caused secondary succession to occur more rapidly by removing the historical disturbance factor (moving sand).

Freshwater Wetlands — These habitats include deflation plain wetlands, sphagnum bogs, and lakes formed by small creeks that have been blocked by moving sand dunes. Sphagnum bogs typically occur in depressions and in coastal headlands with Blacklock soils where water is "perched." Species present in these communities include California pitcher-plant *(Darlingtonia californica)* (figure 6), russet cotton-grass *(Eriophorum chamissonis)*, yellow pond-lily *(Nuphar luteum* ssp. *polysepalum)*, golden-eyed-grass *(Sisyrinchium californicum)*, and bladderwort *(Utricularia vulgaris)*.

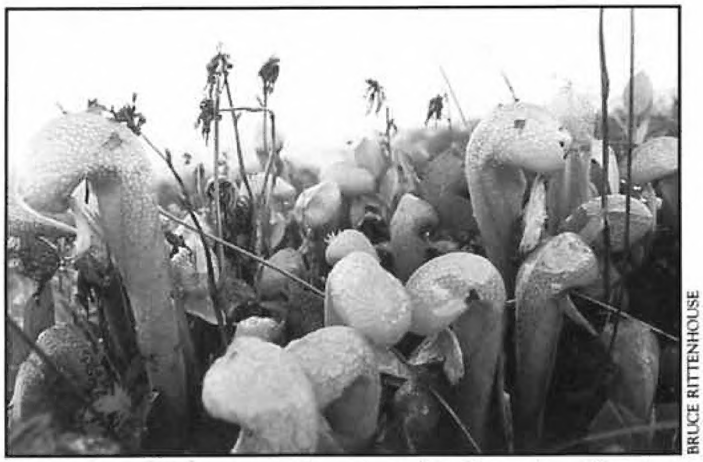
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Figure 6 — California pitcher-plant *(Darlingtonia californica)*

Rare and Unusual Plants

Pink sandverbena — Pink sandverbena *(Abronia umbellata* ssp. *breviflora)* (figure 7) is endemic to the coastal strand and is one of the rarest plants in Oregon. This species historically occurred from British Columbia to central California. However, since the establishment of European beachgrass, it now only occurs along the southern Oregon and northern California coast. Less than 10 occurrences are known in Oregon. The Oregon Department of Agriculture with help from the Army Corps of Engineers, Bureau of Land Management, and U.S. Forest Service have recently been out planting greenhouse grown seedlings at various locations along the coast. This has resulted in an increase in the number of individuals in certain areas. The largest occurrence of pink sandverbena in Oregon occurs on dredge soils at the Port of Port Orford. In 1996 there were approximately 1,000 individuals (Tom Kaye, pers. comm.), mostly as a result of reintroduction efforts. It is hoped that these and future efforts will help increase the populations of this rare and threatened species.

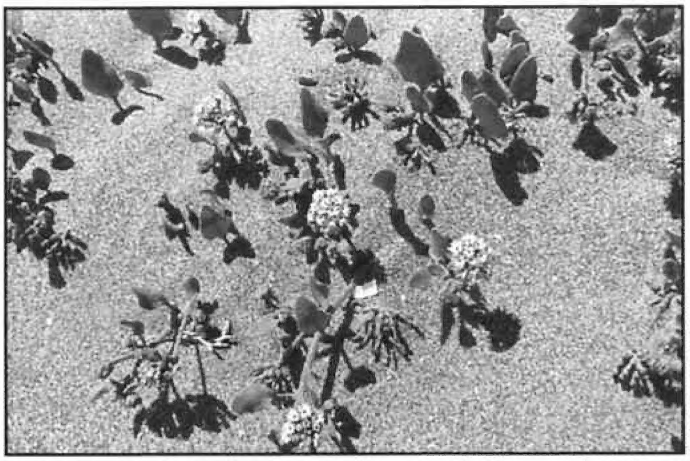
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Figure 7 — Pink sandverbena *(Abronia umbellata* ssp. *breviflora)*

Salt marsh bird's-beak — Salt marsh bird's-beak *(Cordylanthes maritimus* ssp. *palustris)* (figure 8), is a small annual species endemic to coastal salt marshes (restricted to the upper portions) of California and Oregon (Dunn 1987 and Kaye 1991). In Oregon, the majority of the occurrences are in the Coos Bay estuary. This subspecies is listed as threatened by the State of Oregon and was a federal candidate species. The other subspecies, salt marsh bird's-beak *(C. m.* ssp. *maritimus)*, which occurs in southern California salt marshes, is listed as an endangered species (USFWS 1984). Threats include loss of habitat from agricultural and urban development, and off-road vehicle use.

Salt marsh bird's-beak has a very unique ecology. It is a hemiparasite, that is, the plants derive some of their resources directly from photosynthesis and also from other plants (most likely pickleweed) through underground root connections (Chuang and Heckard 1971). This connection with other plants is critical in seedling survival (Dunn 1987). Seed germination occurs in late-February and March and appears to be stimulated by lowered soil salinity from winter rains (1981). Seed dispersal is primarily local as the plants have no mechanism for forcibly dehiscing seeds, although seeds may be dispersed long distances through tides and birds. This subspecies appears to be self-pollinating as no insects have ever been observed on plants in spite of high pollinator activity within the salt marsh plant community (Kaye 1991, and field observations). The pollen to ovule ratio also indicates an in-breeding system (Cruden 1977, Kaye 1991). Dissected flowers show that the anthers have the ability to disperse pollen directly on to the stigmatic surface.

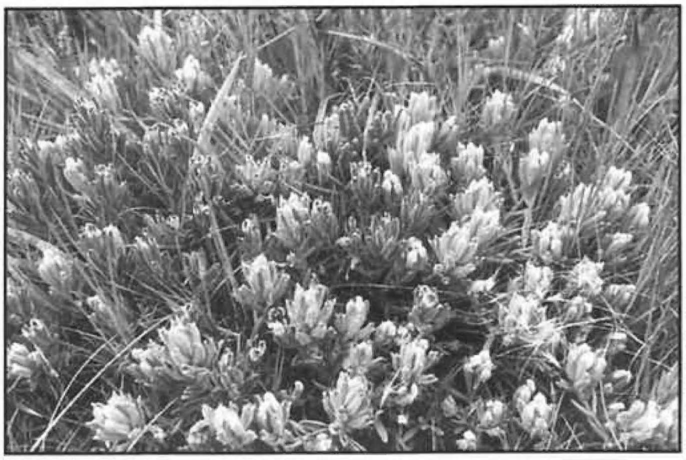
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Figure 8 — Salt marsh bird's-beak
(Cordylanthes maritimus ssp. *palustris)*

Large-flowered goldfields *(Lasthenia macrantha* ssp. *prisca)* — This subspecies occurs on coastal bluffs and is restricted to Curry County, from Cape Blanco to north of Brookings (Ornduff 1971). It is a candidate species in the State of Oregon and was reently removed from the federal candidate list. Large-flowered goldfields has very showy yellow flowers about 2 cm. across, occurring singularly on stems. Leaves are narrow and linear. When the plants are not flowering they are very difficult to identify. This subspecies is known from less than 10 locations, although threats appear to be minimal at this time. Very little information about breeding system, pollination, life span, seed dispersal/germination, etc. is known about this species.

Seaside gilia — Seaside gilia *(Gilia millefoliata)* is a classic example of a species that has been ovelooked as a rare species. In 1992 I collected a specimen from Floras Lake. Munz (1959) identifies the habitat and range as coastal strands from San Francisco Bay to southern Oregon. No mention was made of its rarity and it appeared to be one of many California species which occur along the southern Oregon coast. In 1995 I received a call from Peter Morrell, a doctoral student from Claremont, CA. who is doing work on genetic relationships of the *Gilia laciniata* group, who asked me if I had ever seen this species. Apparently this species was known only from 11 disjunct sites (the Floras Lake site was unknown). This species has never been included on any rare plant lists in California and Oregon. Since this discovery, it has been added to rare plant lists in both states.

Gilia millefoliata is a small glandular annual with tiny purplish flowers, each corolla lobe having a pair of bright purple spots. Plants flower from May to July, depending on spring precipitation. Habitat includes semi-stabilized sand dunes within 300 meters behind the beach (Morrell pers. comm.). At Floras Lake the plants occur in small open sandy areas surrounded by stabilized dunes consisting of red fescue. Seaside gilia appears to be an obligate self-pollinator. Morrell (unpubl. data) has shown that these widely disjunct populations are genetically similar, perhaps indicating that this is a relatively young species.

Disjunct Species — This area of the coast has many species which appear to be out of their normal range and/or habitats. Examples include sticky tofieldia *(Tofieldia glutinosa* var. *glutinosa)*, Macloskey's violet *(Viola macloskeyi* ssp. *pallens)*, bog violet *(V. lanceolata* ssp. *lanceolata)*, and buckbean *(Menyanthes trifoliata)*. All of these species either occur in coastal sphagnum bogs or other wetland habitats.

Sticky tofieldia has an interesting story that was summarized by Chambers (1991a). Two subspecies *(brevistyla* and *occidentalis)* are known to occur in Oregon, in the Cascades and in the Siskiyous of southwest Oregon (The Jepson Manual changes the specific epithet from *glutinosa* to *occidentalis*, but for simplicity in this article will be referred to as *glutinosa*). The only way to identify the species to subspecies is to have mature seeds. Based on old herbarium collections from Coos County, Chambers was able to identify the specimens as ssp. *glutinosa*. This subspecies occurs from British Columbia and Alaska, across Canada to the Atlantic Coast (Hitchcock et al 1969, Chambers 1991a). Then why does the species occur in a bog from Coos County? Chambers (1991a) proposes two hypothesis: 1) that this population is a southern range extension from British Columbia and is a relict population from colder climates; or 2) was introduced from the Atlantic Coast in cranberry *(Vaccinium macrocarpon)* starts. As of 1991 no occurrences had been documented since the 1926 collections, but since then I have found this subspecies growing on Nature Conservancy land at Bastendorff Bog near Charleston, New River ACEC, at Blacklock Point. Interestingly, all of these populations occur in native habitats which appear to have no apparent disturbance.

Two violet species pose interesting taxonomic and biogeographical questions. Macloskey's violet was located at New River ACEC in a sphagnum bog. Hitchcock and Cronquist (1973), Munz (1959) and Hickman (1993) all gave the range as above 1,200 meters. Then why was it growing along the coast at sea level? Dr. Chambers tentatively determined specimens vI collected to be *V. m.* ssp. *pallens*. This still didn't answer the question of why this species was here since Hitchcock et al. (1961) noted that subspecies *pallens* occurs from British Columbia to Washington to the Atlantic Coast. Russell (1955) in his work on acaulescent violets has collections in Oregon only from the Cascades in Deschutes, Douglas, and Lane Counties. It appears that if this plant is actually subspecies *pallens*, some taxonomic and genetic work is needed to solve this mystery.

Bog violet, an eastern North American species, also occurs in this region of the coast. It has been previously collected in cranberry bogs in the Bandon area (Russell 1955) and western Washington (Abrams 1951). Apparently this species was introduced through cranberry starts early in this century, as its reported range is strictly eastern North America (Russell 1955). All my collections (north of Coos Bay and New River ACEC) have been in native plant communities. It appears that this species has since become naturalized in suitable habitats since its introduction.

A small population of buckbean *(M. trifoliata)* occurs in a wetland in the New River ACEC, and is reported from the Blacklock Point area. This population of the species again apears to be a disjunct from the known range and elevation. Hickman (1993) states that the elevation range is between 900-3,200 meters but that it has been reported to occur along the northern California coast. In Oregon, this species occurs primarily on the west slope of the Cascades (Abrams 1951).

These and other species [*Trientalis arctica, Cornus canadensis (unalaschkensis)* (Chambers 1991b), and possibly *Viola langsdorfii*] occurring within this section of the coast are at the southern limit of their ranges. They appear to be a group of relict populations from when the climate was colder, or in some cases have been introduced and since become naturalized.

Best Areas and Times for Viewing Wildflowers

Much of the public land along this stretch of coast is administered by either the Oregon State Parks or the Bureau of Land Management, Coos Bay District. State parks in the area include Sunset Bay, Shore Acres and Cape Arago near Charleston, Bullards Beach just north of Bandon, and Floras Lake/Cape Blanco parks north of Port Orford. BLM administered lands occur at the Coos Bay Shorelands (North Spit of Coos Bay) and New River Area of Critical Environmental Concern (ACEC). Be sure to wear the appropriate clothing when visiting these areas and bring clothes for a wide temperature range as conditions may change quickly and will vary depending on proximity to the ocean.

Access to the parks in the Charleston area is through Coos Bay and North Bend (follow the signs from Highway 101). These parks consist of coastal headlands, Sitka spruce and mixed coniferous forest, and a few remnant sphagnum bogs. The parks have trails from Sunset Bay to Cape Arago (approximately 3-4 miles) most of which are right along the coast. Species such as Bolander's sneezeweed, purple iris *(Iris douglasiana)*, cat's-ear *(Calochortus tolmiei)*, frosted paintbrush, and western lily can be found here. For some species such as Bolander's sneezeweed this is the northern limit of its range.

The best time for wildflowers is June and July. Winter is also a good time to visit as this is one of the best places to see large waves, along with seeing the annual Shore Acres Holiday Lights Show (the botanical garden is illuminated with 125,000 Christmas lights).

Bullards Beach is along highway 101 about 2 miles north of Bandon, just north of the Coquille River bridge. This park provides year-round camping opportunities. The area is primarily composed of stabilized sand dunes from the establishment of European beachgrass, but has coniferous forests dominated by shore pine in the campgrounds. The best time for wildflower viewing at this park is from April to June. One will likely see cream cups *(Platystemon californicum)*, California beach-aster *(Lessingia filaginifolia* var. *californica)*, and silvery phacelia.

Floras Lake State Park can be accessed by taking the county road to the Cape Blanco Airport, across from Pacific High School. This road dead ends at the airport, but there is a trail head where hikers can walk out to Blacklock Point, overlook the mouth of the Sixes River or walk to Floras Lake. This area is dominated by mixed coniferous forests with shore pine, Sitka spruce and many native shrubs including evergreen huckleberry, black twinberry *(Lonicera involucrata)*, rhododendron, Sitka alder *(Alnus sinuata)*, and wax-myrtle. The park also includes a pygmy shore pine forest on Blacklock soils. Here the tallest trees are approximately 10-20 feet tall. The coastal bluffs provide a unique and very harsh habitat for the species present there, including black crowberry and common juniper.

Cape Blanco, the western most point in Oregon, provides the visitor with exposed coastal headlands. Much of the area in the vicinity is closed to the public (although tours of the lighthouse are available) due to safety concerns. Trails east of the lighthouse along the bluffs provide the visitor with good opportunities to view many species of coastal wildflowers, such as angelica *(Angelica* ssp.), frosted paintbrush, and elegant piperia *(Piperia elegans)*. Rare species at Cape Blanco include large-flowered goldfields and Bigelov's microseris *(Microseris bigelovii)*, although the latter has not been relocated in recent years. Best times to visit Cape Blanco to view wildflowers is from June to August.

Cape Blanco is also known for its high occurrence of rare lichen species. These species occur on the boles and branches of exposed scattered Sitka spruce trees. Some of these species are known from relatively few sites in North America. Species include *Neibla caphalota, Sulcaria badia, Bryoria pseudocapillaris, Anaptychia setifera, Buellia oidalea, Heterodermia leucomelos*, and *Teloschistes flavicans*.

Access to the BLM-administered lands on the North Spit of Coos Bay is via the Horsefall Beach turnoff from Highway 101 north of North Bend. Follow the Trans-Pacific Parkway to the end of the pavement. If one wants to continue down to the jetty a four-wheel drive vehicle is necessary. An unimproved sand road takes off on the right about one-third mile past the North Spit boat launch. This road goes along the foredune for about 4 miles to the jetty. Extensive deflation plain wetlands are visible from the foredune. One can continue down the bay side of the spit where there are coastal salt marsh plant communities.

New River ACEC can be accessed from Highway 101 at several locations. Overall, this ACEC consists of over 1,000 acres along the coast south of Bandon to Langlois. The best time to visit the New River area is from May to July. The farthest north access is Fourmile Creek. Turn right just past the west coast game park (going southbound) and head west about two miles. BLM manages about 15 acres at this site and one can see a small remnant dune with many native species. Here is also evidence of the impacts that gorse has on native plant communities.

The Storm Ranch part of New River is accessed from highway 101 at Croft Lake Road. Drive west for about 2.5 miles and turn right onto a gravel road when the road makes a sharp turn to the left. Park at the buildings where many short trails begin; one can see several different plant communities ranging from wetlands, sphagnum bogs, coastal meadows, and stabilized sand dunes.

The third access point to New River ACEC is at Floras Lake. Here the BLM manages approximately 170 acres north of the lake. Just south of Langlois on 101, after crossing Floras Creek turn left and follow the signs to Boice-Cope county park. Park at the outlet of the lake and cross the small bridge to reach the public lands. Here are some of the best dune plant communities in this section of coast. Unique species at this site include silvery phacelia and the northern most population of seaside gilia. North of the lake is one of the most extensive native fescue dune mat communities on the southern Oregon coast. During the summer months portions of the beach are closed to protect nesting western snowy plovers (*Charadrius alexandrinus* ssp. *nivosus*).

Plant Lists by Habitats

The following list is not comprehensive but includes the common plant species. Since some may occur in more than one habitat they may be repeated. Nomenclature follows that of Hickman (1993) or Hitchcock and Cronquist (1973).

Beaches and Sand Dunes (Coastal Strand)

Glehnia littoralis ssp. *leiocarpa*, *Agoseris heterophylla*, *Achillea millefolium*, *Ambrosia chamissonis*, *Ambrosia bipinnatifida*, *Anaphalis margaritacea*, *Artemisis pycnocephala*, *Gnaphalium purpureum*, *Hypochaeris radicata*, *Cryptantha leiocarpa*, *Cakile edentula*, *Cakile maritima*, *Cardionema ramosissimum*, *Honkenya peploides*, *Calystegia soldanella*, *Lupinus littoralis*, *Phacelia argentea*, *Abronia latifolia*, *Abronia umbellata* ssp. *breviflora*, *Camissonia cheiranthifolia*, *Platystemon californicum*, *Eriogonum latifolum*, *Polygonum paronychia*, *Rumex acetosella*, *Rumex maritimus*, *Fragaria chiloensis*, *Claytonia exigua* ssp. *exigua*, *Plectritis brachystemon*, *Juncus lesueurii*, *Juncus supiniformis*, *Ammophila arenaria*, *Aira caryophylla*, *Anthoxanthum odoratum*, *Briza maxima*, *Bromus carinatus* ssp. *maritimus*, *Bromus diandrus*, *Bromus japonicus*, *Cynosurus echinatus*, *Festuca rubra*, *Holcus lanatus*, *Leymus mollis* ssp. *mollis*, *Poa confinus*, *Poa macrantha*, *Vulpia myuros*.

Stabilized Sand Dunes

Pteridium aquilinum ssp. *pubescens*, *Picea sitchensis*, *Pinus contorta* ssp. *contorta*, *Glehnia littoralis* ssp. *leiocarpa*, *Sanicula arctopoides*, *Achillea millefolium*, *Agoseris heterophylla*, *Aster* ssp., *Baccharis pilularis*, *Bellis perennis*, *Conyza canadensis*, *Gnaphalium purpureum*, *Hypochaeris radicata*, *Leontodon taraxioides*, *Lessingia filaginifolia* var. *californica*, *Senecio jacobaea*, *Tanacetum camphoratum*, *Berberis* sp., *Cardionema ramosissimum*, *Silene gallica*, *Arctostaphylos uva-ursi*, *Gaultheria shallon*, *Vaccinium ovatum*, *Cystisus scoparius*, *Genista monospessulana*, *Lotus formosissimus*, *Lupinus arboreus*, *Lupinus littoralis*, *Ulex europaea*, *Centaurium muehlenbergii*, *Camissonia cheiranthifolia*, *Armeria maritima*, *Gilia millefoliata*, *Eriogonum latifolium*, *Eriogonum nudum* var. *paralinum*, *Calandrinia ciliata*, *Fragaria chiloensis*, *Salix hookeriana*, *Triphysaria eriantha* ssp. *eriantha*, *Carex* spp., *Brodiaea terrestris* ssp. *terrestris*, *Calochortus tolmiei*, *Zigadenus fremontii*, *Agrostis* spp., *Aira caryophylla*, *Ammophila arenaria*, *Anthoxanthum odoratum*, *Bromus diandrus*, *Cynosurus echinatus*, *Danthonia californica*, *Holcus lanatus*, *Poa confinus*, *Poa unilateralis*, *Vulpia myuros*.

Coniferous Forests

Blechum spicant, *Pteridium aquilinum* var. *pubescens*, *Polystichum munitum*, *Lycopodium clavatum*, *Polypodium scouleri*, *Chamaecyparius lawsoniana*, *Thuja plicata*, *Abies grandis*, *Picea sitchensis*, *Pinus contorta* ssp. *contorta*, *Pseudotsuga menziesii* var. *menziesii*, *Tsuga heterophylla*, *Hieracium albiflorum*, *Berberis* sp., *Vancouveria hexandra*, *Alnus rhombifolia*, *Alnus rubra*, *Corylus cornuta* var. *californica*, *Lonicera hispidula* var. *vacillans*, *Lonicera involucrata*, *Sambucus racemosa* var. *racemosa*, *Cornus canadensis*, *Arbutus menziesii*, *Arctostaphylos columbiana*, *Arctostaphylos uva-ursi*, *Gaultheria shallon*, *Ledum glandulosum*, *Rhododendron macrophyllum*, *Rhododendron occidentale*, *Vaccinium ovatum*, *Vaccinium parvifolium*, *Lithocarus densiflorus* var. *densiflorus*, *Garrya elliptica*, *Ribes sanguineum*, *Lycopus uniflorus*, *Umbellularia californica*, *Myrica californica*, *Epilobium angustifolium*, *Boschniakia hookeri*, *Trientalis latifolia*, *Ceanothus thyrsifolius*, *Rhamnus purshiana*, *Amelanchier alnifolia* var. *semiïntegrifolia*, *Crataegus douglasii*, *Holodiscus discolor*, *Malus fusca*, *Oemleria cerasiformis*, *Rubus* ssp., *Salix hookeriana*, *Scrophularia californica*, *Viola sempervirens*, *Carex obnupta*, *Lilium columbianum*, *Maianthemum dilatatum*, *Xerophyllum tenax*, *Calypso bulbosa*, *Goodyera oblongifolia*, *Listera cordata*.

Sphagnum Bogs

Solidago spathulata, *Senecio triangularis* var. *angustifolius*, *Lycopodiella inundata*, *Drosera rotundifolia*, *Lotus formosissimus*, *Hypericum anagallioides*, *Menyanthes trifoliata*, *Ledum glandulosum*, *Gaultheria shallon*, *Lysimachia terrestris*, *Vaccinium macrocarpon*, *Trientalis arctica*, *Sanguisorba officinalis*, *Darlingtonia californica*, *Viola macloskeyi* ssp. *pallens*, *Lysichiton americanum*, *Carex* spp., *Dulichium arundinaceum*, *Eriophorum criniger*, *Eriophorum chamissonis*, *Sisyrinchium californicum*, *Juncus ensifolius*, *Juncus oxymeris*, *Lilium occidentale*, *Tofieldia glutinosa* ssp. *glutinosa*, *Calamagrostris nutkaensis*.

Coastal Headlands, Bluffs and Prairies

Picea sitchensis, *Pinus contorta* var. *contorta*, *Corylus cornuta* var. *californica*, *Lonicera involucrata*, *Gaultheria shallon*, *Pteridium aquilinum* var. *pubescens*, *Lycopodium clavatum*, *Vaccinium ovatum*, *Chamaecyparius lawsoniana*, *Carpobrotus chilensis*, *Angelica hendersonii*, *Angelica lucida*, *Heracleum lanatum*, *Achillea millefolium*, *Baccharis pilularis*, *Erigeron glaucus*, *Grindelia nana*, *Helenium bolanderi*, *Hypochaeris radicata*, *Lasthenia macrantha* ssp. *prisca*, *Senecio bolanderi*, *Wyethia angustifolia*, *Berberis* sp., *Cochlearia officinalis* var. *arctica*, *Erysimum capitatum*, *Erysimum menziessi* ssp. *concinnum*, *Lonicera hispidula* var. *vacillans*, *Sagina* ssp., *Dudleya farinosa*, *Sedum spathulifolium*, *Marah oreganus*, *Cuscuta californica* var. *occidentalis*, *Empetrum nigrum*, *Arctostaphylos uva-ursi*, *Juniperus communis*, *Phacelia nemoralis* ssp. *oregonensis*, *Romanzoffia tracyi*, *Sidalcea malvaeflora*, *Myrica californica*, *Clarkia amoena* ssp. *amoena*, *Epilobium angustifolium*, *Oenothera wolfii*, *Boschniakea hookeri*, *Plantago coronopus*, *Armeria maritima*, *Eriogonum latifolium*, *Delphinium menziesii*, *Fragaria chiloensis*, *Sanguisorba occidentalis*, *Salix hookeriana*, *Heuchera micrantha*, *Saxifraga howellii*, *Castilleja affinis* ssp. *littoralis*, *Veronica* sp., *Centranthus ruber*, *Viola adunca*, *Carex* spp., *Iris douglasiana*, *Calochortus tolmiei*, *Calamagrostis nutkaensis*, *Holcus lanatus*, *Dactylis glomerata*, *Nardus stricta*, *Poa unilateralis*, *Sieglingia decumbens*, *Piperia elegans*.

Freshwater Wetlands

Isoetes sp., *Equisetum telmatiea*, *Lycopodiella inundata*, *Botrychium multifidum*, *Picea sitchensis*, *Salix hookeriana*, *Solidago spathulata*, *Callitriche* sp., *Ledum glandulosum*, *Vaccinium macrocarpon, Vaccinium uliginosum* ssp. *occidentale, Lotus formosissimus, Gentiana sceptrum, Cicendra quadrangularis, Hypericum anagallioides, Lycopus uniflorus, Utricularia vulgaris, Lysimachia terrestris, Menyanthes trifoliata, Myrica californica, Nuphar luteum* ssp. *polysepalum, Centunculus minimus, Ranunculus flammula* var. *ovalis, Potentilla anserina* ssp. *pacifica, Potentilla palustris, Gratiola neglecta, Veronica* sp., *Viola lanceolata* ssp. *lanceolata, Lysichiton americanum, Carex aquatilis, Carex obnupta, Carex pansa, Carex* spp., *Dulichium arundinaceum, Eleochaeris macrostachys, Eriophorum chamissonis, Scirpus acutus, Scirpus americanus, Sisyrinchium californicum, Juncus balticus, Juncus effusus, Juncus lesueurii, Juncus oxymeris, Juncus falcatus, Lilaea scilliodes, Maianthemum dilatatum, Spiranthes romanzoffiana, Deschampsia caespitosa, Panicum acuminatum, Phalaris arundinacea, Polypogon maritimus, Potomogeton natans, Potomogeton richardsonii, Ruppia maritima, Sparganium emersum* ssp. *emersum, Typha latifolia, Sanguisorba officinalis, Spiraea douglasii, Hydrocotyle ranunculoides, Hydrocotyle verticillata.*

Saltwater Wetlands

Grindelia stricta var. *stricta, Jaumea carnosa, Spergularia canadensis* var. *occidentalis, Spergularia macrotheca* var. *macrotheca, Atriplex patula* var. *obtusa, Salicornia virginica, Cuscuta salina* var. *major, Plantago maritima, Limonium californicum, Glaux maritima, Cordylanthus maritimus* ssp. *palustris, Scirpus americanus, Scirpus maritimus, Scirpus cernuus, Juncus gerardii, Triglochin concinna* var. *concinna, Triglochin maritima, Deschampsia caespitosa, Hordeum jubatum, Distichlis spicata, Parapholis incurva, Puccinellia pumila, Zostera marina.*

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ESTES' ARTEMISIA

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By HOWIE BROUNSTEIN

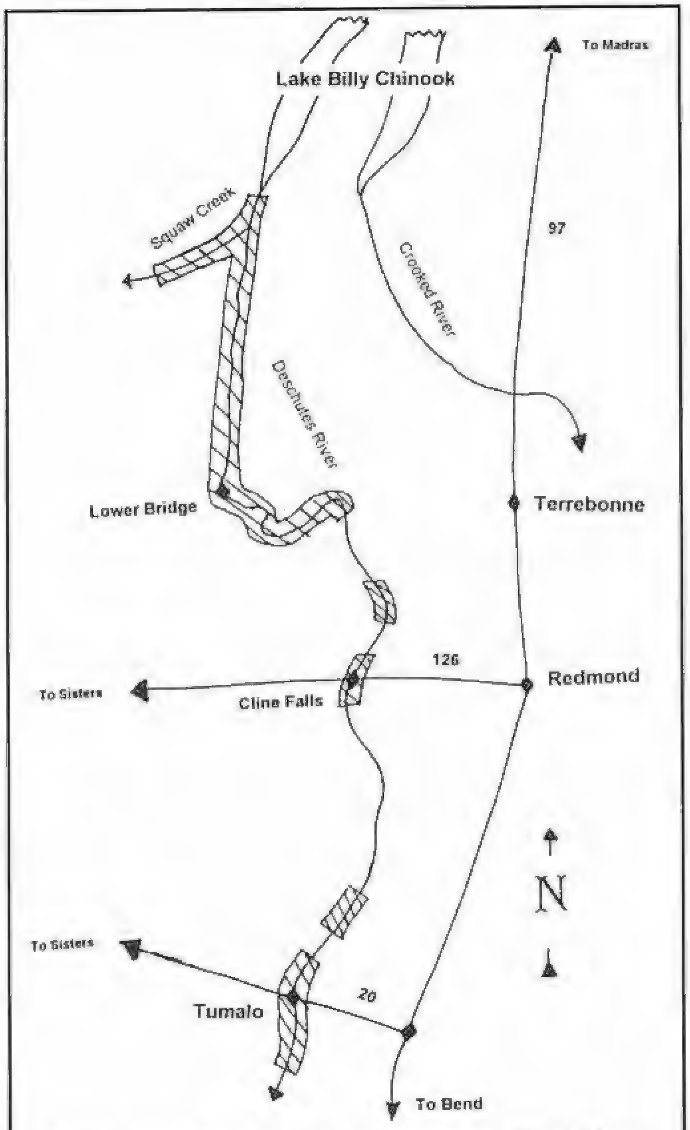
From the rim of the Deschutes canyon, the Three Sisters and other snow-capped peaks loom on the western horizon. The scent of desert shrubs fills my lungs. Looking across the rim I see circling ravens. Hundreds of feet below me, along the Deschutes River, is the silvery white hue of the plant I am seeking. Slowly I work my way down around large boulders covered with crustose lichens and past bones of an unfortunate deer who stepped too close to the edge during the winter. I finally reach the bottom of the canyon. The cries of coyotes echo in the distance as I find a trail through the thick bushes, carefully avoiding the stinging nettle, *Urtica dioica*. When the ground becomes moist and the river's edge is close enough to touch, I can smell the endemic Estes' artemisia.

Estes' artemisia, *Artemisia ludoviciana* Nutt. ssp. *estesii nom. ined.*, is an herbaceous plant in the sunflower family (Asteraceae). It is a relative of the common desert sagebrushes, *Artemisia tridentata* and *A. tripartata*, armoatic shrubs ubiquitous in desert ecosystems of the American West. Wormwood, *Artemisia absinthium*, is another aromatic shrub of the genus infamous when brewed into the narcotic alcoholic liquor, absinthe. Sagewort and mugwort are the common names for the herbaceous members of the genus. "Wort" is an archaic term for any herbaceous plant. (*Artemisia vulgaris* was the mainstay for brewing beer in medieval Europe, hence the name, mug plant.) The leaves of the Eurasian dragon sagewort, *Artemisia dranunculus*, provide the household herb, tarragon. According to Hitchcock and Cronquist, there are greater than one hundred species of artemisia found throughout the northern hemisphere and South America.

Estes' artemisia is a sweet smelling herb found only on the Deschutes River of Central Oregon's high desert steppes. It is on the Oregon Natural Heritage Program List 1 of taxa threatened or endangered throughout their range. Previously, the only known vouchered location was from Dr. James Estes' 1966 sighting of a small population near a falls on the Deschutes River east of Redmond.

It seemed reasonable that the achenes of the plant could be spread by water; so in 1990 I started searching the Deschutes River near the original population and a few adjacent tributary creeks for additional stands. I found that subspecies *estesii* was the most common artemisia along some stretches of the Deschutes. The largest of these populations was located near Lower Bridge. This spot had easy access to the river, so I started the study area there, moving both up and down stream until populations of artemisia were no longer found, or the canyon became inaccessible. From 1990 until 1994 students would descend into the study area with me, measuring plots, counting stems, and recording associations. We found significant numbers of this local endemic only on the Deschutes River. Population sighting reports are filed in the Oregon Natural Heritage Program's database of sensitive plants.

Identifying herbaceous artemisias can require a discerning eye. The different species and subspecies are extremely variable and interbreed freely. Plants can exhibit leaf shape and size, plant height, pubescence, and aroma of neighboring species. New spring and fall growth is usually atypical, appearing to be of a different species. This is not a problem in many areas of California, where there is often one species of herbaceous artemisia in a given area. On the Columbia River Gorge, on the other hand, numerous species can occur along a single



Approximate *Artemisia ludoviciana* ssp. *estesii* Study Area. Subspecies *estesii* was not found at all these sites. Map not to scale.

river drainage. The key to deciphering this problem is to look at many mature plants in a stand during flowering and generalize from the most common characteristics. If you find more than one generalized type, for example many tall artemisias with a medium amount of leaf lobing, and many short artemisias with generally very lobed leaves, then there may be two types of artemisias in one stand.

At present, my students and I have located millions of stems of this plant over 20.5 miles of riverbank, and I can come to some fairly reliable generalizations, especially about habitat. The relationship to the high water mark can be an important identifying characteristic with herbaceous artemisias. At the original site, the habitat description is "gravelly areas next to streams, *above* the high water mark.. (Hopkins and Garrett 1990). I have seen this habitat described for subspecies *estesii* in a number of sources. Although I have often noticed small subpopulations around falls and on isolated rock outcrops at the river's edge, I consider this the fringe of its habitat. These scattered populations of seventy-five stems or fewer are common in the study area, but account for no more than five percent of the population. The large, thick stands (often 20 feet or more in diameter) always occur on planar to slightly undulating, moist riverbanks *below* the high water mark. These very dense stands can contain as many as 65,000 stems in a 300 square foot plot. In wet years this perennial can reach heights of over 12 feet, and taking population counts in these large stands can be very pleasant as the air is laden with the plants' fragrance. Similar herbaceous artemisias are said to promote dreams in folklore. Plants at these sites often form thick rhizomatous mats that appear to interconnect the numerous stems. I have found that the rhizomes smell stronger than the aboveground parts. This field characteristic helped me to distinguish subspecies *estesii* from other *A. ludoviciana* subspecies found on the Deschutes.

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The plant associations are also very consistent. The herb layer generally consists of bittersweet nightshade, *Solanum dulcamara*, the escaped European yellow iris, *Iris pseudacorus*, and the cattail, *Typha latifolia*. Occasionally the stands are solid artemisia with little herbaceous competition. The shrub layer consists of spirea and willow. These shrubs are not usually in the stand itself, but often between subspecies *estesii* and the high water mark. This makes locating and counting the plant very difficult at times, since these shrubs have a tendency to becomes very thick. The canyon wall is over 500 feet high in some places, and often boulders from the cliff obscure any trail among these shrubs. The best way to get an accurate count of this artemisia is by boat from the river itself. My students and I did our searching by foot, so the population counts may be lower than the actual numbers.

In late September the plants on the river begin to die back. Estes' artemisia will often start some fall vegetative growth. Most herbaceous artemisias have a distinctive conspicuously green leaf color with a white tomentose pubescence. This creates the characteristic silvery green color when seen from a distance. The senescent stems of this plant also retain this unique color. In the fall, it may be difficult to positively identify which artemisia it is, but if one is sure of the subspecies, it is a good time of year to see populations. Artemisia patches stand out, easily seen among the other vegetation. It is even possible in some areas to walk above the river basin at the base of the cliffs, or on the rim itself, and spy the populations with binoculars. Searching for autumn populations in this manner is even easier than searching by boat. At this time of year the water level is at its lowest. In some places it may be possible to walk along the river's edge, or hop from rock to rock, and gain entry to the more inaccessible stands.

During this field work, the history of the study area often left an impression on us. Old deserted barns and roads which today seem to lead nowhere remain from decades ago. Obsidian arrowheads and faded rock paintings hint that an even more ancient group of people had wandered this basin before us. We see the ruins of stone walls near the canyon rim. Hunters from a time long past crouched behind these walls to hide from approaching deer herds. These archaeological deer blinds assure me that the deer populations wintered here long ago, as they do today. Carefully working our way down the steep canyon slopes towards the cliff bottom, the colored stains, numerous caves, and rock outcrops form odd shapes on the wall across from us. This reminds me of how I watched the shapes of clouds as a young child. We see images of faces, animals, giant creeping rhizomes, and everything we can imagine on the rock walls; our group is distracted from population counts.

The Cascade Mountain range runs north and south dividing Oregon geographically and floristically. Much of the west side of the Cascades is a temperate rainforest, dominated by Pacific hemlock, *Tsuga heterophylla*, and Douglas fir, *Pseudotsuga menziesii*. In that ecosystem, Douglas's mugwort, *Artemisia douglasiana*, is the most common herbaceous artemisia. The east side of the Cascades is of course much drier. In our study area the Deschutes River runs through sagebrush steppes consisting of mixed junipers, *Juniperus* sp., and sagebrush, *Artemisia tridentata*. The most common herbaceous artemisia on this river is *Artemisia ludoviciana*. The Columbia River forms the border of Oregon and Washington at the bottom of a scenic gorge. This gorge is ecologically unique with many sensitive endemic plants. The Columbia also provides a pathway for plant species movement between the ecological "halves" of the state. Here the range of *Artemisia douglasiana* overlaps with numerous other species of artemisia.

When I originally keyed out Estes' artemisia in Hitchcock's *Flora of the Pacific Northwest*, it appeared to be a cross between A. *douglasiana* (the common western Cascade species) and A. *ludoviciana* (the common eastern Cascade species). Hitchcock mentions that the *Artemisia douglasiana* passes into the A. *ludoviciana* ssp. *latiloba*, meaning that characteristics intergrade at the region of contact. After determining the true name of the plant, I realized that the A. *ludoviciana* ssp. *estesii* had more characteristics that matched the A. *douglasiana* than the ssp. *latiloba*. At that point I assumed that the two plants (A. *douglasiana* and subspecies *estesii*) must be closely related, and that subspecies *estesii* was probably a cross between the eastern and western artemisias as Hitchcock implied.

Strangely enough these two plants are the farthest apart of all northwestern species in their chromosomal makeup. Subspecies *estesii* is most closely related chromosomally to the coastal mugwort, A. *suksdorfii*. This proves again that our plant classification system is artificial and only approximates reality. Taxonomists strive to order the multitude of plantlife into a system that reflects evolutionary reality, yet our ideas of that reality are constantly changing. The relationships among different plants are "real," but the keys seldom are. New floras like *The Jepson Manual* and *The Flora of North America North of Mexico* rename and reorder families, genera, and species to incorporate current research, but it is still a forced arrangement. Two species may be close to each other in a taxonomic key, but this does not necessarily reflect a true biological or evolutionary relationship as most keys are artificial.

JOHN REUTER

The genetic makeup of subspecies *estesii* and its relationship to other artemisia species was the focus for the doctoral thesis of Dr. James Estes at Oregon State University (1968). It appears that both A. *suksdorfii* and subspecies *estesii* are diploids, having two sets of chromosomes. A. *ludoviciana* is tetraploid, having four sets of chromosomes, and A *douglasiana* is hexaploid, having six sets of chromosomes. Clausen, Keck, and Hiesey (1940) believed that A. *douglasiana* ($2n=27$, west side) was a hybrid between A. *ludoviciana* ($2n=18$, east side) and A. *suksdorfii* ($2n=9$, coastal). Unfortunately, since many of the herbaceous species of artemisia have compatible chromosomes that pair up regularly, this can be quite tricky to confirm or disprove by chromosomal analysis alone. Dr. Estes (1968) writes, "Evidence was gathered in this study... that casts doubt on Clausen, Keck, and Heisey's explanation of the origin of A. *douglasiana*." One of these pieces of evidence was, "The discovery of another diploid, (subspecies *estesii*), that is closely related to A. *suksdorfii* but that varies from it in the direction of A. *douglasiana*."

With the easy interchange of chromosomes, it is biologically significant to find a diploid subspecies in an area where the other races are tetraploid. How did this arrangement evolve? Is there some present reproductive advantage to this arrangement? Plants with more than two sets of chromosomes, polyploids, are believed to have evolved from diploid plants. When a polyploid is formed from diploids that have different habitats, often the polyploid will begin to compete with the original diploids in their own habitats. The polyploid may also occupy sites that are intermediate between the two parents, and often extend into ecological niches that neither parent can survive in.

Stebbins (1956) described the possible evolution of a polyploid complex, such as artemisia. At first there are polyploids and many successful diploid taxa. Later the polyploids are successful and common, and the diploids are mostly extinct, limited in range to local endemics. Eventually the diploids become extinct, and secondary series of polyploids with a different chromosome number arises. Finally these polyploids evolve into taxa with very high chromosome numbers.

Artemisias in the Northwest consist of numerous polyploids with only a handful of diploid taxa. Subspecies *estesii* is a geographically isolated endemic with a narrow range. Estes concludes that more research is necessary, "However it is quite possible that the two diploid taxa, *A. suksdorfii* and (subspecies *estesii*), are relicts of a once larger, continuous population in the Northwest." Should other diploid races similar to this one be found on river drainages not connected to the Deschutes, it would raise interesting evolutionary questions for herbaceous artemisias. The stage is set for further research concerning artemisias in Central Oregon.

JOHN REUTER

George Sturtz is an artemisia farmer in the Willamette Valley researching alternative oil crops. He has analyzed the constituents from the oils of subspecies *estesii* and other native species of this genus. Subspecies *estesii* oil is unique among the Northwest artemisias. It is very high in thujones, comparable to the oil from the European *A. absinthium*. All the other native herbaceous artemisias have insignificant amounts of thujones, except for *A. suksdorfii* which has a significant amount, though much less than subspecies *estesii*. This further confirms the close relationship of the two diploid taxa. This may also suggest that subspecies *estesii* is stronger than other native artemisias physiologically as a narcotic, anti-fungal, anti-bacterial, anti-parasitic, and insect repellent.

Estes' artemisia is not under legal protection despite its current classification because its name, proposed by Dr. Kenton Chambers of Oregon State University, is as yet unpublished.

The study area is undergoing drastic transformations. River access across private land is being restricted as development occurs. The largest verified population of Estes' artemisia is the site of a new county park, and trails are already replacing some stands. A portion of the river is set aside for a Wilderness Study Area; however, this designation could change at any time if local policies change. The dry weather and irrigation laws also have an impact on these riparian plants. Property owners lose their water rights unless they can demonstrate via aerial photographs that they have used their water to make the desert green. Many owners who have no wish to farm plant cover crops to protect their investment. This waste of resources together with the 1994 drought caused the river in the study area to stop flowing in August, and fill with algae. Estes' artemisia generally grows shoulder high and above when blooming; however, in 1994 it averaged knee high.

Now that subspecies *estesii* has been shown to be more than a genetic anomaly from a single location, and with conservation issues at hand, Dr. Chambers has agreed to formally publish his proposed name. The description of its morphological characteristics will be a difficult task with its extreme variability. This is not a problem along the Deschutes River, but will become very important when identifying artemisias in other parts of Oregon. Unfortunately for field workers, a chromosome count is the most accurate means of identification.

This spring, when *Iris pseudacorus* shows its yellow flowers in great profusion along the banks of the Deschutes, you may find me squatting around the high water mark. I'll be taking in the fragrance, pondering how every river has its scent. This one, rising from the Estes' artemisia, is indeed unique.

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Albert Raddin Sweetser, Founder of the University of Oregon Herbarium

By RHODA M. LOVE

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Albert and Carrie Sweetser. 50th anniversary, 1938.

Albert Raddin Sweetser (1861-1940), was born on July 15, 1861 in Mendon, Massachusetts, the son of a Methodist minister. Young Albert was educated in the Massachusetts public schools and later attended the Wilbraham Academy. From there he went to Wesleyan University in Middletown, Connecticut, where he received his Bachelor of Arts degree in 1884 and a Master of Arts in 1887. Later he studied chemistry for a year at the Massachusetts Insitute of Technology. Following this, he obtained teaching positions in a Methodist seminary in Bucksport, Maine and a second Methodist school in Tilton, New Hampshire. On February 29, 1888, in Centerville, Massachusetts, the bride's hometown, he was married to Carrie Knowles Phinney whom he had met on Cape Cod. The groom was 27 years old and the bride 25. In the summer of 1892, Albert and Carrie were at Rangeley Lakes, Maine, teaching at a boys' camp where Carrie kept a charming illustrated journal which survives in the University of Oregon Knight Library Special Collections. (For me, one of the highlights of Carrie's Maine journal is a photo of her, in full skirt and mutton sleeves, holding up a freshly-caught fish!) In 1893 Sweetser entered the Harvard Graduate School of Botany and remained there for four years. While there, he worked as a teaching assistant in botany and also taught at Radcliffe College.

The Sweetsers Move West

Albert and Carrie Sweetser came West in 1897 when he accepted a teaching position at Pacific University in Forest Grove, Oregon, for $1,000 per year, and apparently they never looked back (at least not in life)! In a 1898 letter from Forest Grove to one of his former Harvard University mentors, Merritt Lyndon Fernald, Sweetser wrote, in part: "You recognize the voice that comes to you from the wild west? It is indeed in many ways wild enough... The climate is very mild;... I got my first wild flowers the last day of February. The flora is new to me as if I had been dropped into a foreign land... The lichens and mosses simply cover everything in extravagant profusion." The letter continues: "We are planning for our summer, if all goes well, a sort of moving collecting trip. I have bought a very good horse for twenty dollars and a second hand buckboard for fifteen and we propose to cover as large an area as possible." But Sweetser complains a bit in this letter about his teaching job at Pacific University: "The greatest out [sic] about this place is the slowness with which salary comes in. The hard times have tied up their vested funds so that the income is very meager."

The University of Oregon

Albert and Carrie were able to escape the "meager" salary at Pacific University when he was invited to join the faculty at the University of Oregon in Eugene in 1902 at an annual salary of $1,250! He started at the University as professor of botany and seven years later became the head of the Department of Botany. Albert and Carrie bought a comfortable bungalow (since, unfortunately, demolished) at 1723 Alder Street in Eugene and Sweetser taught at the University until

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Carrie Sweetser circa 1892.

his retirement in 1931, after which he became Professor Emeritus. Soon after arriving at the University, Sweetser was appointed State Biologist. In 1909, at Sweetser's urging, the University of Oregon entered into an agreement with the University of Washington in Seattle, whereby the Oregon school would administer the Oceanograpahic Laboratories at Friday Harbor in the San Juan Islands of Washington State. The Sweetsers spent a number of summers at Friday Harbor while Sweetser taught summer school at the labs. A photo journal of the Sweetsers' summers at Friday Harbor, with notations in Carrie Sweetser's hand, survives in the University of Oregon archives. It includes many turn-of-the-century snapshots of the Friday Harbor Labs, of other sites in the San Juan Islands, and of personnel associated at the time with the Universities of Oregon and Washington.

From all accounts, A.R. Sweetser seems to have been a hard worker, a gifted teacher and an exemplary human being. He was apparently a much loved professor who inspired many students. LeRoy Detling wrote of Sweetser a year after the latter's death: "His deep understanding of the problems of young people, his kindly personal interest, and his keen sense of humor have endeared him to the many students who have come in contact with him during his years of instructing. It was his purpose to build an appreciation of nature in as many people as possible, and to this end he wrote a considerable number of popular botanical articles for newspapers and journals and accepted frequent invitations to lecture before various clubs." In appearance, Sweetser was a mild-appearing man with short hair parted in the middle, a tidy mustache, and dark-rimmed spectacles. Carrie was a sweet faced woman with a very determined chin.

Considering their interest in young people, and an apparently strong and loving marriage, it seems a pity that Albert and Carrie had no children. However, the two raised her nephew, George Phinney, as if he were their own son. One of the students inspired by Sweetser was Lilla Irvin, of Barlow, Oregon, who received her B.A. in Botany from the University of Oregon where she studied with Sweetser. Lilla Irvin later married John Leach. This couple is commemorated in the name of one of Oregon's most famous endemic shrubs, *Kalmiopsis leachiana*, which she and John discovered in southwest Oregon in 1930. Of Lilla Leach, Sweetser is said to have remarked: "She was my most distinguished student."

The Herbarium

Albert Sweetser also played an important role in the establishment and growth of the University of Oregon Herbarium. Sweetser founded and served as Curator of the Herbarium of the University of Oregon from 1903 until 1924 when he hired Louis F. Henderson to fill this position. An intriguing mystery exists with respect to the hiring of the curator: Certain Sweetser letters in the Archives suggest that in 1920, he tried unsuccessfully to lure Morton E. Peck away from Willamette University. Remnants of correspondence suggest that at one point, the deal had indeed been consumated. Yet, Peck did not move to Eugene, and four years later Henderson was hired. I have attempted to track down the details of the failed transaction at Oregon, and Susan Kephart of Willamette University has tried to find pertinent corespondence there, but so far, we have only a few tantalizing clues. It is interesting to speculate how the history of botany at both the University of Oregon and Willamette University might have differed had Peck made the move. Two of Sweetser's important early acquisitions for the young Oregon Herbarium were 10,000 herbarium sheets each from Oregon collectors Thomas Jefferson Howell (1842-1912) and William Conklin Cusick (1842-1922). Also acquired in the early years were the collections of L.F. Henderson, J.B. Leiberg, M.W. Gorman, and E.P. Sheldon. See David Wagner's "History of the UO Herbarium" in the 1994 *Kalmiopsis*. Although Wagner does not mention the collection of Kirk Whited, a 1908 letter from Sweetser to Whited, then at Laidlaw, Oregon, suggests that a significant number of specimens was acquired from this collector as well.

Collecting Trips

During his years as curator as well as before, Sweetser organized several long spring and summer plant exploring and collecting trips. His letters mention a trip to Crater Lake, and journal notes describing one such trip he and Carrie took by automobile to the Kerby Quadrangle in southwest Oregon in April and May, 1923, survive in his papers in the Oregon Special Collections. Of the trip, Sweetser wrote, in part: "The University granted leave of absence in the month of May, and the writer and his wife, with camp outfit, collecting materials, photographic apparatus and sketching materials, left Eugene on the morning of April 27th,... Wolf Creek Tavern was reached in the afternoon [of the 28th]. It had been reported that there was a line of contact at this place between *Erythronium giganteum* and *E. hendersonii.* Although a careful search was made, no specimens of either could be found, the flowering season being past. Later, however, pressed specimens collected by the botany class of the Wolf Creek High School, and very acurately labeled, were sent to me at the University. Both species were found at this point..."

Later, at camp on April 29: [We] "set up our stove, made our bed on the floor and got supper and went to bed. Woe and more woe. In hollow tones the Lady imparted the information that her mattress was sinking and the air must be leaking. Blew it up again but without avail. So she tried to repose on one of the cushions but had a hard and uncomfortable night." (The diaries of Albert and Carrie Sweetser make wonderful reading. Not only do they capture the details of the Oregon flora and the botanist's life in the early twentieth century, but they are also illustrated with snapshots of the countryside, automobiles, tents, camping gear and people, and the narration is alive with the sparkling sense of humor of this delightful pair.)

On this trip the Sweetsers were collecting and camping with fellow botanist, Lincoln Savage, principal of the Kerby High School, and Mrs. Savage. They also made contact with a woman collector of the region, Anne Marie Finch, whose story is presently being researched by Ken Phillips of Cave Junction. One of the purposes of the trip seems to have been to attempt to relocate some of Thomas Jefferson Howell's original collecting sites. Sweetser's journal includes a photograph of Savage standing on a serpentine hillside near Waldo, in Josephine County, where Savage first observed Howell collecting in 1889. On May 5, with the Savages "...Found the apparent meeting place of *Erythronium hendersonii* and

E. gigantea [sic] along a line bearing about N. 80 E. To the east and south *E. hendersonii*, to the west and north *E. gigantea*. A great variety of apparent hybrids of the two were found as is shown by the specimens collected."

Near the end of their trip, at Page Mountain on May 21: "A little higher the zone of balsamroots was reached and the whole mountainside was a golden glory." It has been reported that in later years Sweetser usually drove a Buick automobile and that if he spotted an interesting plant in a field, he was likely to drive his car off the road and right into the field to have a closer look! The sketching materials mentioned earlier were for the Lady, Carrie Phinney Sweetser, who was a talented wildflower artist. In 1941, over three-hundred and thirty of her beautiful life-sized watercolor paintings of Oregon wildflowers were donated to the University of Oregon Special Collections where they can be seen today.

Botanical History of the Northwest

Back home in Eugene, Sweetser busied himself with his teaching, and with gathering detailed notes for a history of the botanical exploration of the Pacific Northwest, on which he worked for over twenty years. Charles Vancouver Piper (1867-1926) and Rolla Kent Beattie (1875-1960) of Washington State University in Pullman also collected copious notes on this subject. Sweetser accumulated documents on this subject which presently fill two feet of space in the Special Collections at the University of Oregon Knight Library. It is a great pity that none of these individuals lived to finish this work. Nevertheless, their notes have been of enormous help to the writers and editors of "Plants Hunters of the Pacific Northwest." With regard to the University of Oregon Herbarium, founded by Sweetser in 1903, it had grown to a collection of well over 100,000 sheets when, in 1993, it was permanently moved to Oregon State University in Corvallis.

Honors and Death

Sweetser received an honorary Ph.D. from the University of Oregon in 1931, the year of his retirement. Louis Henderson named both an Oregon species and a variety for Sweetser: *Montia sweetseri* and *Synthyris rotundifolia* var. *sweetseri*; neither name is valid today. One reference lists Sweetser as a plant name author, but I have been unable to locate a species named by him. A dormitory on the University of Oregon campus is, however, named for Sweetser! Sweetser became a member of Sigma Xi, AAAS, the Medical Society of America, the Society of American Bacteriologists, the Botanical Society of America, the American Association of University Professors, the National Geographic Society and was an associate member of the American Museum of Natural History. He was the author with Mary E. Kent of a small popular "Key and Flora" of Oregon, and author of a number of shorter articles. Another of Sweetser's major interests was the conservation of native flora. He was the author of a large number of popular essays on Oregon plants, and initiated a number of campaigns to save Oregon's roadside plants and wildflowers. In Eugene he was a member of the First Methodist Church and a church trustee. On the Sweetsers' 50th wedding anniversary in 1938, Albert and Carrie were honored with a reception by members of their congregation. A.R. Sweetser died at his home on September 12, 1940 at the age of 79. Carrie Sweetser outlived her husband by almost precisely 12 years, dying September 9, 1952 at the age of 89. Both are buried in the Phinney family plot in Massachusetts. They were survived by George Phinney whose descendants still live in the Eugene area.

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Albert Sweetser (l.) and Louis F. Henderson. Date unknown.

Modified from an essay that will appear in the forthcoming book: "Plant Hunters of the Pacific Northwest," edited by Arthur R. Kruckeberg and Rhoda M. Love.

Acknowledgements

I wish gratefully to thank the staffs at the University of Oregon Knight Library Special Collections, and the University of Oregon Archives for making the papers of Albert and Carrie Sweetser available to me and for their unfailing helpfulness during my researches.

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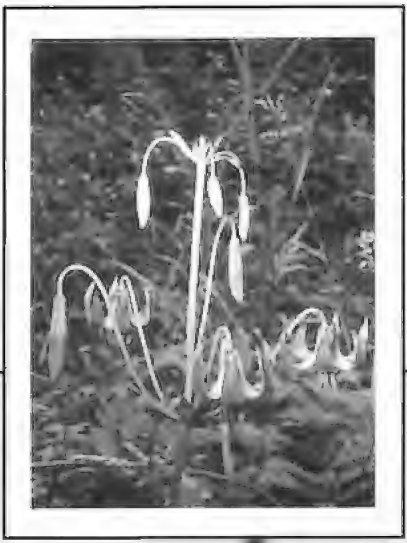
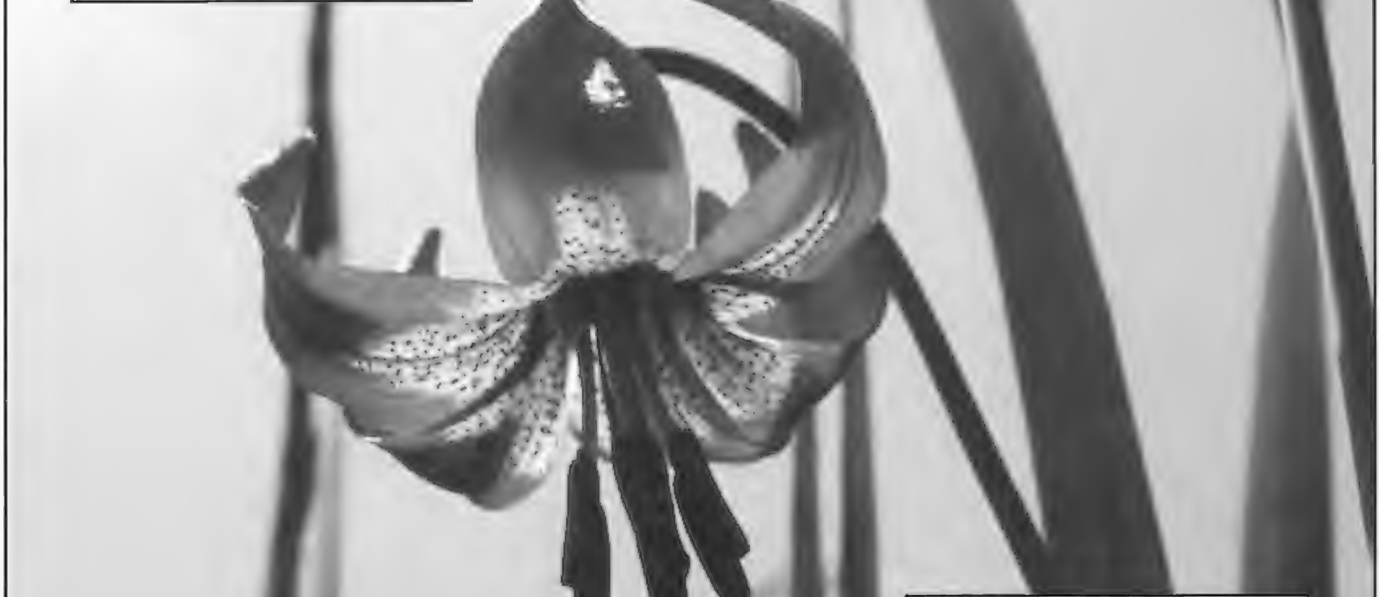


Candelabra

Lilium occidentale



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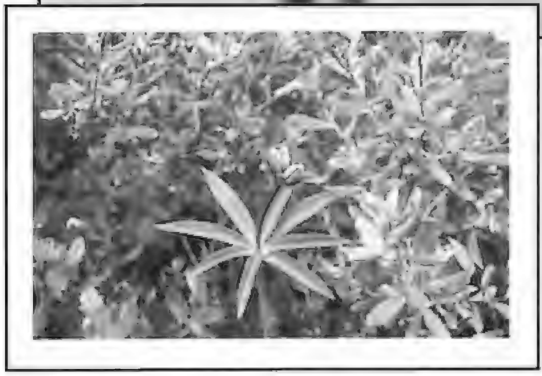
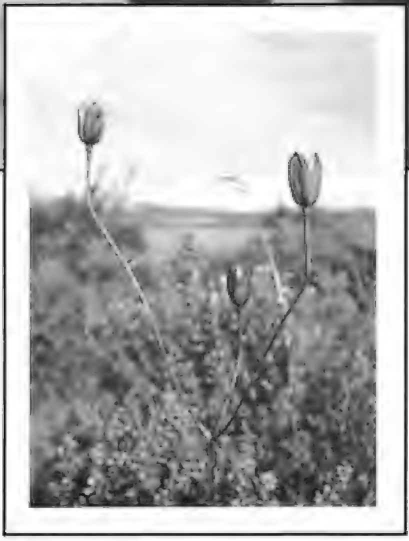


Bud and foliage



Dehisced capsules

Western Lily, *Lilium occidentale* (Liliaceae)

By EDWARD O. GUERRANT, JR.

Like a string of old lighthouses, the endangered western lily *(Lilium occidentale)* is known from a diminishing number of beleaguered coastal locations. Since its discovery around the turn of the century, western lily has been found at some 60 sites, all at low elevations (less than 100 m.) from Coos Bay, Oregon, to Humboldt Bay, California. Superficially, it might seem that a species with so many populations would have a relatively secure future. Nevertheless, there are good reasons it is listed as endangered both federally and by California and Oregon. Indeed, the plight of western lily and the response by concerned citizens, private organizaions and public agencies, makes it a veritable poster-child for the struggle faced by native plants everywhere.

Biology

With a striking golden star in the center of its pendant crimson flowers, and stamens tightly circling its style and stigma, western lily is a distinctive member of an easily recognized genus. Like other lilies, it is an herbaceous perennial that dies back to the ground each fall. Rhizomes (usually called bulbs) may produce one or more flowering shoots each year that may reach a height of 2.5 meters, typically with 1-3 (up to 25 or more) flowers. Seedlings and small juveniles have only a single leaf, with larger plants having linear leaves distributed singly or in 1-9 whorls along the stem.

Western, or bog lily as it is also known, occurs in early to mid-successional bogs or coastal scrub on poorly drained soils, generally those underlain by an iron pan or barely permeable clay layer. It appears to require a habitat that maintains a delicate balance between having some surrounding vegetative structure, but not too much shade. Flowers often emerge from the surrounding shrubby vegetation, where they are exposed to direct sunlight and can be found by hummingbirds, their primary pollinators.

Threats

Western lily merits endangered status for many reasons. It is hardly surprising for a species that inhabits relatively level ground along a very scenic stretch of coast within a day's drive of two major metropolitan areas to be under intense development pressure. However, an even more menacing long-term threat is competitive exclusion by shrubs and trees, a particularly pernicious threat because it is invisible to the casual observer.

Of the approximately 60 locations at which Western lily populations have ever been seen approximately one third appear to have been extirpated, and the fate of another sixth are unknown. Thus up to half of the known populations have disappeared this century — which works out on average to the loss of one population every three to five years! Over two thirds of the populations that remain have 100 or fewer individuals, and only two have over 1,000.

Conservation

Although western lily was only listed as endangered by the US Fish and Wildlife Service in 1994, and the recovery plan is still only in draft form, concerted private and public efforts to recover the species have been going on for almost a decade.

The State of California has been actively involved in western lily recovery for almost a decade. In 1987, a management plan was prepared for the Table Bluff Ecological Reserve, near Humboldt Bay, CA. Since that time, Dave Imper and his colleagues have been managing the species at this site for the Calfornia Department of Fish and Game. They have been able to experimentally examine the impact of a variety of factors on lily population growth. For example, they have been able to examine the effects on lily population growth rate of selectively cutting spruce trees and limbs to let in more light to a population of chronically suppressed individuals.

Private organizations and landowners have been doing their part too. The California Nature Conservancy's landowner contact program was instrumental in obtaining the active cooperation of several landowners. With their support, Imper has been helping to manage three populations on private land in Humboldt County. Not only are these populations benefiting from active management, we are learning how to manage for this species in ways that might be applied elsewhere. For example, it is primarily through these cooperative efforts that controlled experiments have shown that cattle grazing, if properly controlled, can help reduce competition with shrubs, and thus help maintain a suitable habitat for western lily.

Long term monitoring data, and experimental manual removal of woody competitors have also been applied to populations near the northern end of the range. Stewart Schultz and the Oregon Nature Conservancy have been monitoring a population on Nature Conservancy land for almost a decade. By 1994 the dismal trend toward population extirpation was so clear that active vegtative management was necessary.

The results of these experiments in manual vegetation removal, to temporarily set back, or at least slow down the clock of ecological succession, were sufficiently encouraging that wider application of the practice is being authorized by the US Fish and Wildlife Service. Bruce Rittenhouse (former president of the NPSO) has organized additional vegetative removal projects, and set up experimental fencing to exclude deer, and therefore greatly increase seed production.

We at the Berry Botanic Garden have seeds of many populations throughout the species' range in our Seed Bank. The genetic legacy of those populations are protected from catastrophic loss in the field. If the worst should happen, and a sampled population becomes extirpated and the threat can be addressed, stored seed can be used for reintroduction.

Perhaps the most uplifting aspect of this saga is the degree to which private citizens have become involved in the recovery of western lily. Citizens, volunteering their time and expertise have contributed to every aspect of western lily conservation. For example, a monitoring network organized by Imper typifies how important individual action can be. Populations throughout the range have been 'adopted' by local citizens, who monitor them each year with a standard protocol. The long term value to the species of having such information, not to mention the vigilant attention of concerned citizens, is immense.

Conservation of endangered species is not so much a scientific or even technical problem as much as it is a matter of societal will. If we as a society choose to sustain the web of life, we will find a way to do it. The broad based flurry of activity that has assembled itself to help the western lily is a beacon of hope showing us the way in from a dark and stormy sea.

Letters

Editor,

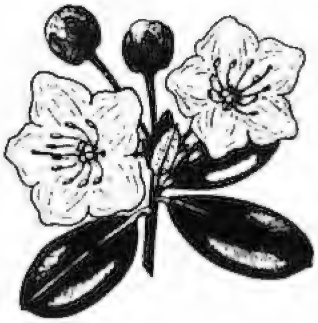
I read with much interest the detailed account of the natural history of the Warm Springs Reservation in the 1995 number of *Kalmiopsis*. Rarely does one find a major Indian reservation to have received such intensive and complete study of its natural amenities. The Yakima Reservation of the Columbia Plateau and the Coastal Indian reservations in British Columbia have been blessed with the scholarly attentions of two ethnobotanists, Drs. Eugene Hunn and Nancy Turner. Note that it is the zeal of ethnobotanists that has made the floras of these native reserves known, both to their indigenous residents and to the latter-day Euro-intruders. It is this ethnobotanical contribution to natural history that prompts me to comment on the need to highlight the Warm Springs studies by the ethnobotanist, Dr. David French. In the Warm Springs article a more fulsome recognition of the contributions of the Frenches, Dave and Kay, and by their young collaborator, Robert Ornduff, should be made.

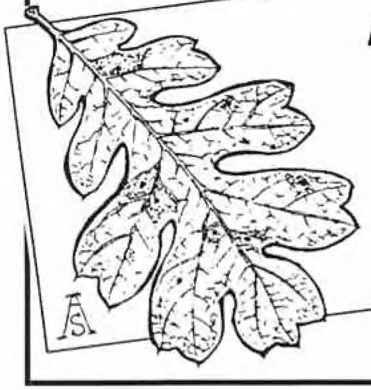
The Frenches and Ornduff, of Reed College, joined to make a definitive baseline study of the plant life of the reservation. Professor Dave French compiled during 1952-53 a substantial set of herbarium specimens of their ethnobotanical researches on the reservation. Further, the Frenches continued to collect in later years. The result of this close cooperation was the authoritative published accounts of the Warm Springs flora and vegetation, as cited only in the bibliography of the article.

I had the good fortune to know Dave French and to have been a close friend of Dr. Ornduff ever since Bob was a Reed College student. Ornduff continues to be a productive botanist at the University of California (Berkeley). His early ventures into plant systematics indeed began with his involvement in the Warm Springs flora and vegetation.

So, for the sections of the *Kalmiopsis* article on the botany of the Warm Springs Reservation, the proper acknowledgement of the significant contributions of the Frenches and of Dr. Robert Ornduff is herewith provided.

— *A.R. Kruckeberg*
Emeritus Professor





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ACKNOWLEDGEMENTS

KALMIOPSIS LOGO: Dr. Linda Ann Vorobik, artist.
TYPESETTING: DianeFassler GraphicDesign, Ashland, OR.
PRINTING: Mustard Press, Medford, OR.

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